Curriculum Vitae

Yulun Wu

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Summary

I am a fourth-year PhD student in the Shallow Water Earth Observation Lab at the university of Ottawa. My research focuses on atmospheric correction for aquatic applications, which is a critical process for deriving satellite-based water quality products like turbidity, chlorophyll concentration, and organic matter. With knowledge in optical remote sensing and image processing, I have been developing atmospheric-correction tools and actively participating in international competitions such as the Atmospheric Correction Intercomparison Exercise co-organized by ESA and NASA.

My PhD thesis involves assessing the influence of land on the reflectance of water captured by satellite sensors through radiative transfer modelling. The code for this work is open source and was recently published in a peer-reviewed article. This work supports and improves remote sensing of understudied waterbodies such as rivers and small lakes.

In the past few summers, I have been leading field campaigns to collect water quality and radiometric data in rivers around Ottawa in collaboration with Agriculture and Agri-Food Canada. In addition, I have worked on various short-term projects collecting ground-truthing data such as water depth and clarity, spatial coverage of salt marsh and eelgrass, and reflectance of various objects such as water and grass.

Education

2020-2025 **PhD in Geography** **GPA: 10/10**
University of Ottawa, Ottawa, ON, Canada / Agriculture and Agri-Food Canada
Thesis: *Modelling and Correcting for the Adjacency Effect in Remote Sensing of Coastal and Inland Waters*
Supervisor: Dr. Anders Jensen Knudby
Committee members: Dr. David Lapen, Dr. Chuiqing Zeng, Dr. Michael Sawada

2021-2021 **Exchange Student, Department of Physics** **4/4**
University of Toronto, Toronto, ON, Canada
Obtained A+ in *PHY2505 Atmospheric Radiative Transfer and Remote Sounding*
Term project: *Atmospheric Impacts of Wildfires and Aerosol Plumes: Two Case Studies Using TROPOMI UVAI*

2014-2019 **Honours Bachelor of Science in Environmental Science (Co-op)** **8.68/10**
University of Ottawa, Ottawa, ON, Canada

Honours Thesis: *The spatial distribution of arsenic and other trace metal contaminants and their acute toxicity to Daphnia pulex in lakes near the Giant Mine in Yellowknife, Canada*
Supervisor: Dr. Jules M. Blais

Research/Work Experience

January 2020 - Present
PhD Student, University of Ottawa / Agriculture and Agri-Food Canada, Ottawa, Canada

- Explore the challenges in aquatic remote sensing over small waterbodies such as rivers and small lakes. This includes studying the adjacency effect from nearby land and atmospheric scattering as well as sun-glint induced by wind and turbulence.
- Monitor agriculture-related water quality changes in rivers of Eastern Ontario using high-resolution satellite imagery including Sentinel-2 MSI, Worldview and PlanetScope.
- Calibrate a dual-channel Jaz UV/visible spectrometer in measuring water's remote sensing reflectance following a skylight-blocked approach; collect water reflectance and constituent data using spectrometers and a YSI EXO3 sonde.
- Assess the accuracy of satellite-derived water reflectance from atmospheric-correction tools such as L2Gen, Sen2Cor and ACOLOTE; model the radiative transfer in Earth's ocean and atmosphere systems using HydroLight, libRadTran and 6S.

April 2022 - June 2023
Assistant Ecologist, Parks Canada, Canada

- Mapped and classified coastal salt marshes and eelgrass beds across national parks and reserves in Canada using aerial and high-resolution satellite imagery.
- Calculated carbon storage and carbon accumulation rate using loss-on-ignition techniques and Pb-210 dating.
- Conducted a one-week field survey of salt marshes and eelgrass beds and mapped their distribution and types on Sidney Island, BC, in June 2022.

January 2022 - March 2022
Contract Worker, Liquid Geomatics, Ottawa, Canada

- Support a project under Canadian Space Agency's FAST program, *Earth observation for detecting and monitoring long-term water quality changes across the Canadian Arctic*, managed by Dr. Knudby.
- Develop a Python-based Monte Carlo code that models the radiative transfer in an atmosphere-ocean-land system and corrects for the adjacency effect for coastal remote sensing; implement surface reflectance models such as water's specular reflection following Cox-and-Munk slope statistics.

February 2020 - Present

Research Assistant, Network on Coastal, Oceans and Lake Optics Remote Sensing (NetCOLOR), Canada

- Assist in drafting the NetCOLOR Community-of-Practice Report 2 which addresses the reliability and accuracy of aquatic optical satellite products over Canadian waters.
- Match Canada-wise in-situ water-quality data with moderate-resolution ocean-colour products from MODIS, VIIRS and OLCI; plot graphs and maps and calculate statistical correlations in R and ArcGIS.

November 2021 - November 2021
Field Technician, Fluvial Systems Research Inc., Vancouver, Canada

- Mapped water depth in the Rupert River and the Pontax River in Waskaganish, Quebec using a single-beam echo sounder to support the ecosystem modelling of Walleye-fish habitats.
- Collected photogrammetry data for modelling fluvial sediment-size distribution.

May 2018 - August 2020 (Two full-time Co-op terms and part-time during school years)
Spatial Analyst, Ottawa Neighbourhood Study, University of Ottawa

- Manipulated and converted demographic and geospatial data to neighbourhood level using Python, R, ArcGIS and Excel; published data through *ONS website.*
- Provided ONS partners with standardized data and customized infographics using R, Python and Tableau; derived evidence-based guidance regarding the distribution of funding from data and infographics (United Way East Ontario uses ONS data to allocate $7.6 M funding to Ottawa communities annually).
- Developed customized Python toolboxes to process spatial data: density/distribution of facilities and events, travel costs (Network Analysis), neighbourhood greenness, food environment, census demographic data and socioeconomic indicators.
- Attended meetings and collaborated with ONS partners such as City of Ottawa, Statistics Canada, Ottawa Public Health, Ottawa Food Bank and United Way East Ontario
- Analyzed the distribution and demographic status of food bank clients in collaboration with Ottawa Food Bank: automated the geocoding of over 30,000 addresses using Python and Google Maps API, processed the information of over one million entries of Food Bank clients using ArcGIS and R, presented the results interactively in *Tableau*.

January 2018 - April 2018 (Co-op)
Assistant Librarian, Ottawa Hospital Research Institute, Ottawa, Canada

- Collaborated with medical researchers in authorizing methodology sections of systematic reviews about public health.
- Refined the use of query languages and Boolean operators in searching articles.
- Presented findings of retracted articles to researchers and stakeholders.

May 2017 - August 2017 (Co-op)

Research Assistant, Kerr Lab, Department of Biology, University of Ottawa

- Evaluated the impact of climate change on Monarch butterflies' geographical limits using species suitability maps and MODIS satellite images.
- Built multi-source geographical and physiological traits databases of 1,500 North American butterfly species using Excel and R.
- Investigated the effectiveness of Species at Risk Act by detecting the habitat landcover changes using multi-year MODIS satellite images.
- Provided literature and GIS support for graduate-student projects and drafted summaries.

Teaching Experience

September 2021 - December 2022
Teaching Assistant, University of Ottawa, Canada

- Gave lab demonstrations and evaluated student assignments and lab reports for courses including MAT1371 *Descriptive Statistics*, GEG3305 *Geographies of Globalization*, GEG4702 *Le développement des villes*, ENV1101 *Global Environmental Challenges*, and GEG3114 *Biogeography* (in chronological order).

Refereed Publication

Wu, Y., & Knudby, A. (2023, July). *A Tool That Calculates the Sea-Surface Reflectance Factor in Customized Environments and Geometry*. The International Geoscience and Remote Sensing Symposium 2023. https://2023.ieeeigarss.org/view_paper.php?PaperNum=3004

Wu, Y., Knudby, A., & Lapen, D. (2023). Topography-Adjusted Monte Carlo Simulation of the Adjacency Effect in Remote Sensing of Coastal and Inland Waters. Journal of Quantitative Spectroscopy and Radiative Transfer, 108589. https://doi.org/10.1016/j.jqsrt.2023.108589

Non-Refereed Publications

Wu, Y. (2022). *T-Mart Radiative Transfer Code and Documentation*. https://tmart-rtm.github.io

Wu, Y. (2021). *Topography-Adjusted Monte Carlo Simulation of the Adjacency Effect in Remote Sensing of Coastal and Inland Waters* [Report in fulfillment of the requirement for fast-tracking into a PhD program]. University of Ottawa.

Wu, Y. (2020, September). Social Distancing: Easy in a Kayak Surrounded by Instruments – Collection of Remote Sensing Reflectance in Rivers. *Geography, Environment and Geomatics Newsletter*. https://arts.uottawa.ca/geography/geg-env-newsletter

Wu, Y., Cheney, C., & Blais, J. M. (2019). *The spatial distribution of arsenic and other trace metal contaminants and their acute toxicity to Daphnia pulex in lakes near the Giant Mine in Yellowknife NWT* [Honours Thesis]. University of Ottawa.

Seminar and Conference Presentations

Wu, Y., & Knudby, A. (2023, July 17). *A Tool That Calculates the Sea-Surface Reflectance Factor in Customized Environments and Geometry*. The International Geoscience and Remote Sensing Symposium 2023, Pasadena, California, the USA.

Wu, Y., Knudby, A., & Lapen, D. (2023, May 29). *Adjacency Effect Modelling and Correction for Remote Sensing of Inland and Coastal Waters*. The Canadian Meteorological and Oceanographic Society 57th Congress, St. John's, NL, Canada.

Wu, Y., & Knudby, A. (2022, February 28). *Topography-Adjusted Monte Carlo Simulation of the Adjacency Effect in Remote Sensing of Coastal and Inland Waters*. Ocean Sciences Meeting 2022, Online. https://osm2022.secure-platform.com/a/gallery/rounds/3/details/5093

Wu, Y. (2021, May 7). *Topography-Adjusted Monte Carlo Simulation of the Adjacency Effect in Remote Sensing of Coastal and Inland Waters*. Geography, Environment and Geomatics Graduate Student Conference, University of Ottawa.

Wu, Y. (2021, March 17). *Topography-Adjusted Monte Carlo Simulation of the Adjacency Effect in Remote Sensing of Coastal and Inland Waters*. The 3rd National NetCOLOR Meeting, Université Laval.

Wu, Y. (2020, September 2). *Retrieval of remote sensing reflectance in the South Nation River, Ottawa*. NetCOLOR Communities-of-Practice Workshop, University of Ottawa.

Wu, Y. (2020, February 24). *Satellite derived water quality observations in inland waters*. Canadian Hydrographic Conference, Quebec City, Canada.

Wu, Y. (2020, February 11). *Remote sensing-based detection of point source pollution in Canadian waterways*. NetCOLOR Communities-of-Practice Workshop, University of Ottawa.

Wu, Y. (2019, November 6). *The use of satellite imagery to monitor inland water quality*. EVS4904 Environmental Science Seminar, University of Ottawa.

Wu, Y. (2019, October 9). *Remote sensing of seaweed in the Atlantic Ocean*. EVS4904 Environmental Science Seminar, University of Ottawa.

Wu, Y. (2019, April 8). *Lakes close to an abandoned gold mine continue to show hazardous metal(loid) concentrations for Daphnia pulex (water fleas) despite a decade of recovery* [Honours Thesis]. Poster Presentation, University of Ottawa.

Guest Lecture

Wu, Y. (2016, February 8). *An overview of industrialization and its environmental impacts in developing countries*. ENV1101 Global Environmental Challenges, University of Ottawa.

Scholarships and Awards

2022-2023 Ontario Graduate Scholarship for International Students ($15,000)
2021-2025 PhD Admission Scholarship, University of Ottawa ($78,500)
2021-2022 Student Experience Fund, University of Ottawa ($1,000)
2021 BMO Financial Group Graduate Bursaries ($4,000)
2020-2021 uOttawa International Graduate Bursary, University of Ottawa ($4,000)
2020-2021 Suzanne Gratton-Sarrazin Scholarship, University of Ottawa ($2,050)
2019-2023 CUPE Employees Financial Aid, University of Ottawa ($1,906)
2019 Roger Guindon Scholarship Fund ($1,000)
2019 Gilles G. Patry Community Engagement Scholarship ($1,000)
2018 J. P. Bickell Foundation Mining Scholarship ($2,000)
2017-2023 uOttawa Financial Aid Bursary for International Students ($3,250)
2017-2019 Faculty of Science Dean's Honour List & Merit Scholarship, University of Ottawa ($3,000)
2017-2019 Science Students' Association International Student Scholarship, University of Ottawa ($1,000)
2017 Brian Rust Memorial Scholarship ($1,600)

Training

2022 International-Ocean-Colour-Coordinating-Group Summer Lecture Series (July 18-29, 2022). Institut de la Mer, de Villefranche, France.

Monitoring Coastal and Estuarine Water Quality Using Remote Sensing and In Situ Data (November 30 - December 7, 2021). NASA ARSET, online training.

International Fall School in Hydrographic Surveying (October 25-29, 2021). Laval University, Quebec City, Canada.

Monitoring Coastal and Estuarine Water Quality: Transitioning from MODIS to VIIRS (September 14-21, 2021). NASA ARSET, online training.

Google Earth Engine Mini-Course (May 25-29, 2020). Carleton University, Ottawa, Canada.

Volunteer Experience

2020-Present Oversee the annual budget of the Geography Graduate Student Association as the treasurer of the association

2017 Managed and updated *the Tree Map* at Ecology Ottawa, Ottawa

2017 Organized events and coordinated volunteers at uOttawa Table Tennis Club

2016 Assisted in administering and recycling of student donations at uOttawa Sustainability Office

Other Information

Advanced operations certificate – small remotely piloted aircraft systems (PRAS)
Wilderness First Aid with CPR training
Canada Pleasure Craft Operator Card
WHIMS, Radiation Safety Certifications
Ontario G Driver's Licence
Over 150 hours of community services and volunteering since 2015

References

Dr. Anders Jensen Knudby
Department of Geography, Environment and Geomatics
University of Ottawa, Ottawa, ON
Thesis Supervisor, Jan 2019 – Present
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Dr. David Lapen
Ottawa Research and Development Centre, Ottawa, ON
Agriculture and Agri-Food Canada
Supervisor at Agriculture and Agri-Food Canada, January 2020 – Present
613-759-1537
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Dr. Michael Sawada
Ottawa Neighbourhood Study
Department of Geography, Environment and Geomatics
University of Ottawa, Ottawa, ON
Principal Investigator at ONS, Sep 2017 – August 2020
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Dr. Jules M. Blais
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Honours Thesis Supervisor, Aug 2018 — Apr 2019
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